GetOnBoardBRT
BUS RAPID TRANSIT IN MONTGOMERY COUNTY
MD 355

MD 355 Bus Rapid Transit

Corridor Planning Study

Natural Resources Technical Report

May 2019

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1 Introduction

The Montgomery County Department of Transportation (MCDOT) is preparing a *Corridor Summary Report* for Phase 2 of the MD 355 Bus Rapid Transit (BRT) Planning Study. The project is evaluating detailed concepts for providing enhanced transit service along MD 355 from Bethesda to Clarksburg in Montgomery County, Maryland.

Phase 2 of the MD 355 BRT Study builds upon work completed in Phase 1, which developed Conceptual Alternatives that were evaluated to determine which should move forward for more detailed analysis. These alternatives have been refined and analyzed in further detail in Phase 2. The purpose of this *Natural Resources Technical Report* is to describe the alternatives development and screening approach used. Information in this report, described below, will support discussions presented in the *Corridor Summary Report*.

1.1 MD 355 BRT Project Purpose and Need

The purpose of the MD 355 BRT Planning Study is to provide a new transit service with higher speed and frequency along MD 355 between Bethesda and Clarksburg. The purpose and need statement has been consolidated into four distinct goals to guide the development of alternatives and as a framework for comparing alternatives**:**

Goal 1. Provide an appealing, functional, and high-quality transit service

Goal 2. Improve mobility opportunities, accessibility, and transportation choices

Goal 3. Support planned development

Goal 4. Support sustainable and cost-effective transportation solutions

1.2 Alternatives

Five alternatives, including the No-Build Alternative, are being evaluated as part of Phase 2 of the MD 355 BRT Planning Study. The findings will be summarized in the *Corridor Summary Report* and are assessed in detail in this Technical Report. The four Build Alternatives are shown in **Figures 2-1 through 2-4**. This *Natural Resources Technical Report* prepared in support of the *Corridor Summary Report* assesses existing conditions and the changes in the natural area associated with each alternative.

Figure 2-1: TSM Alternative

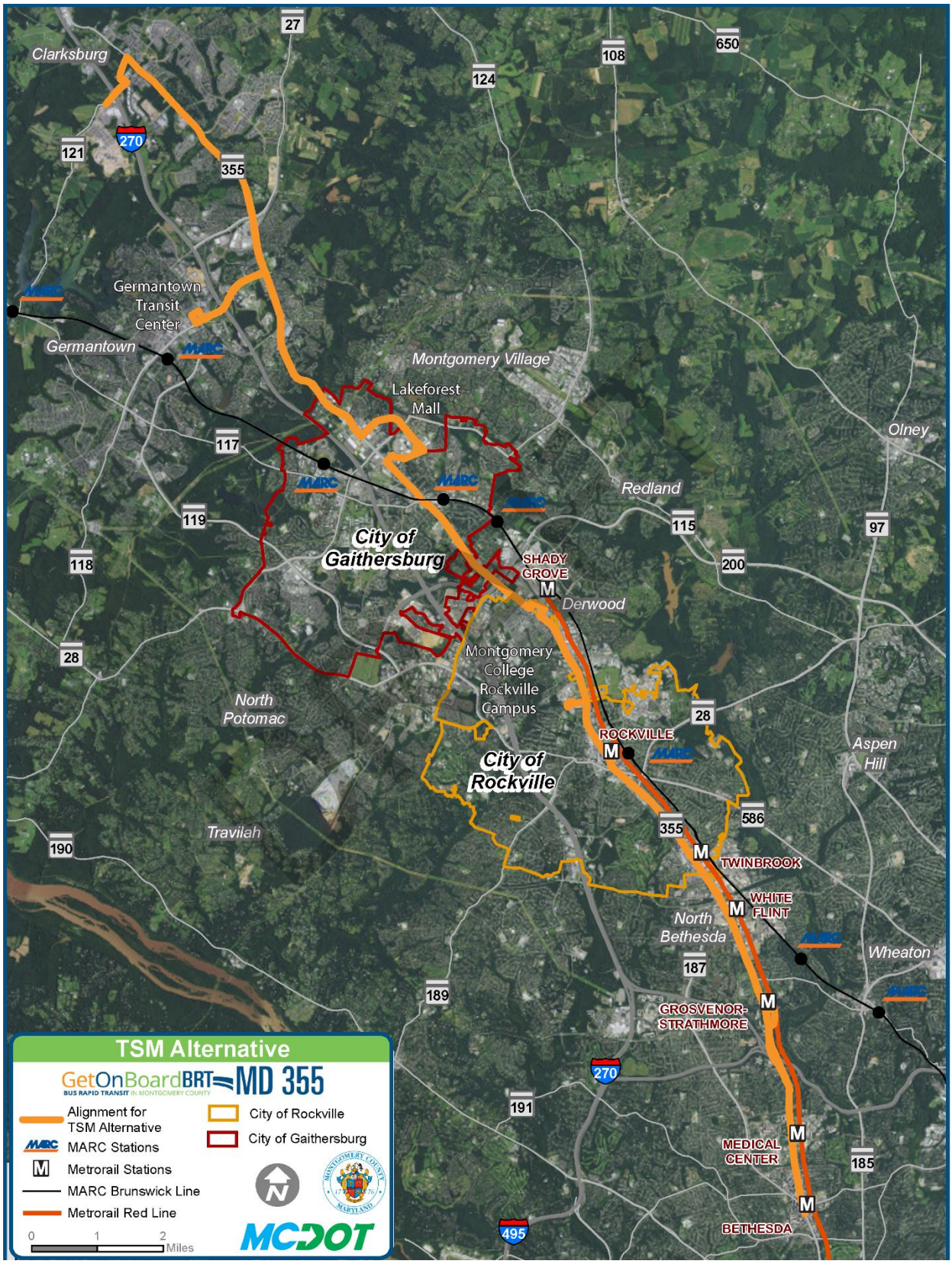


Figure 2-2: Alternative A

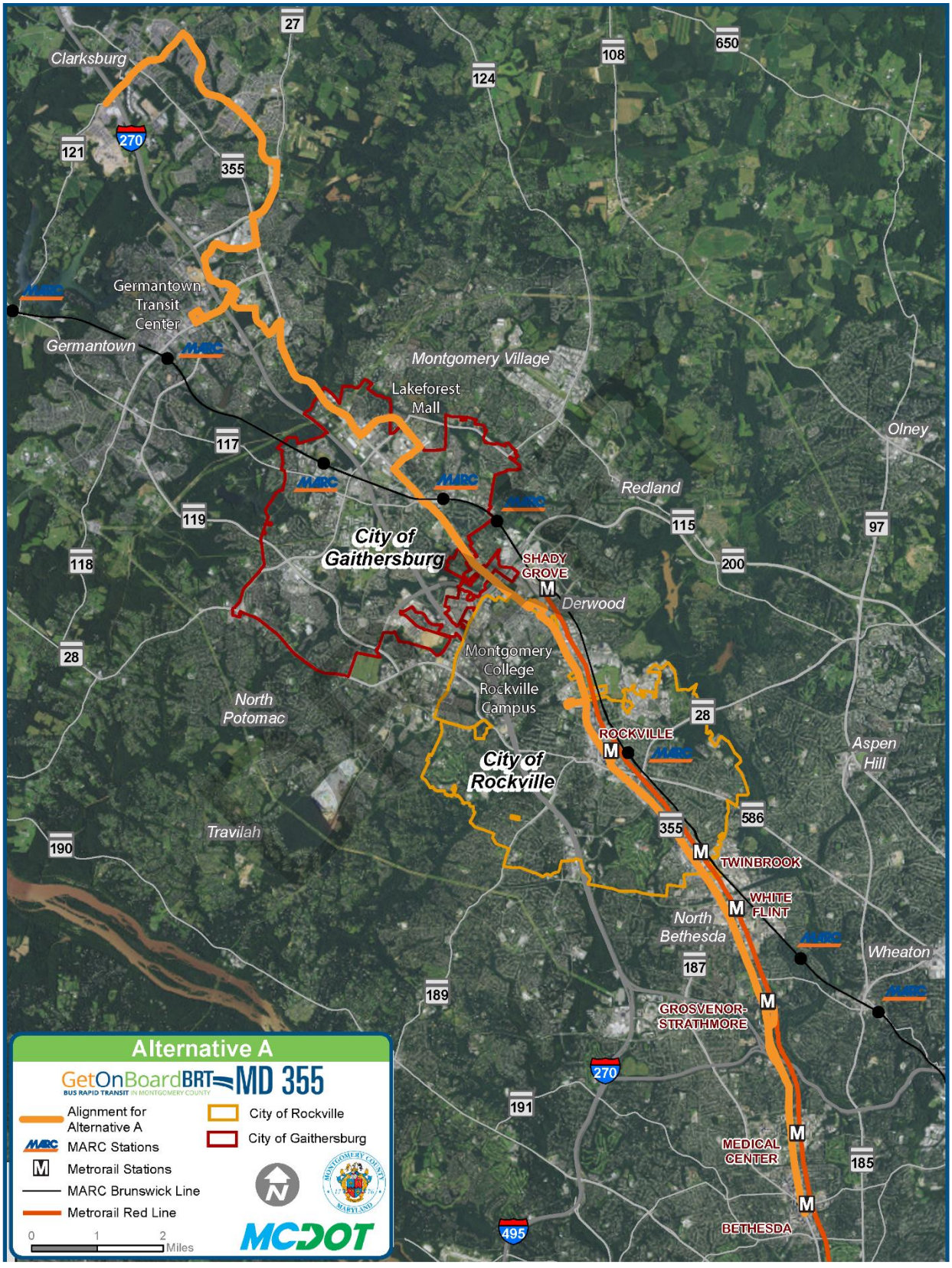


Figure 2-3: Alternative B

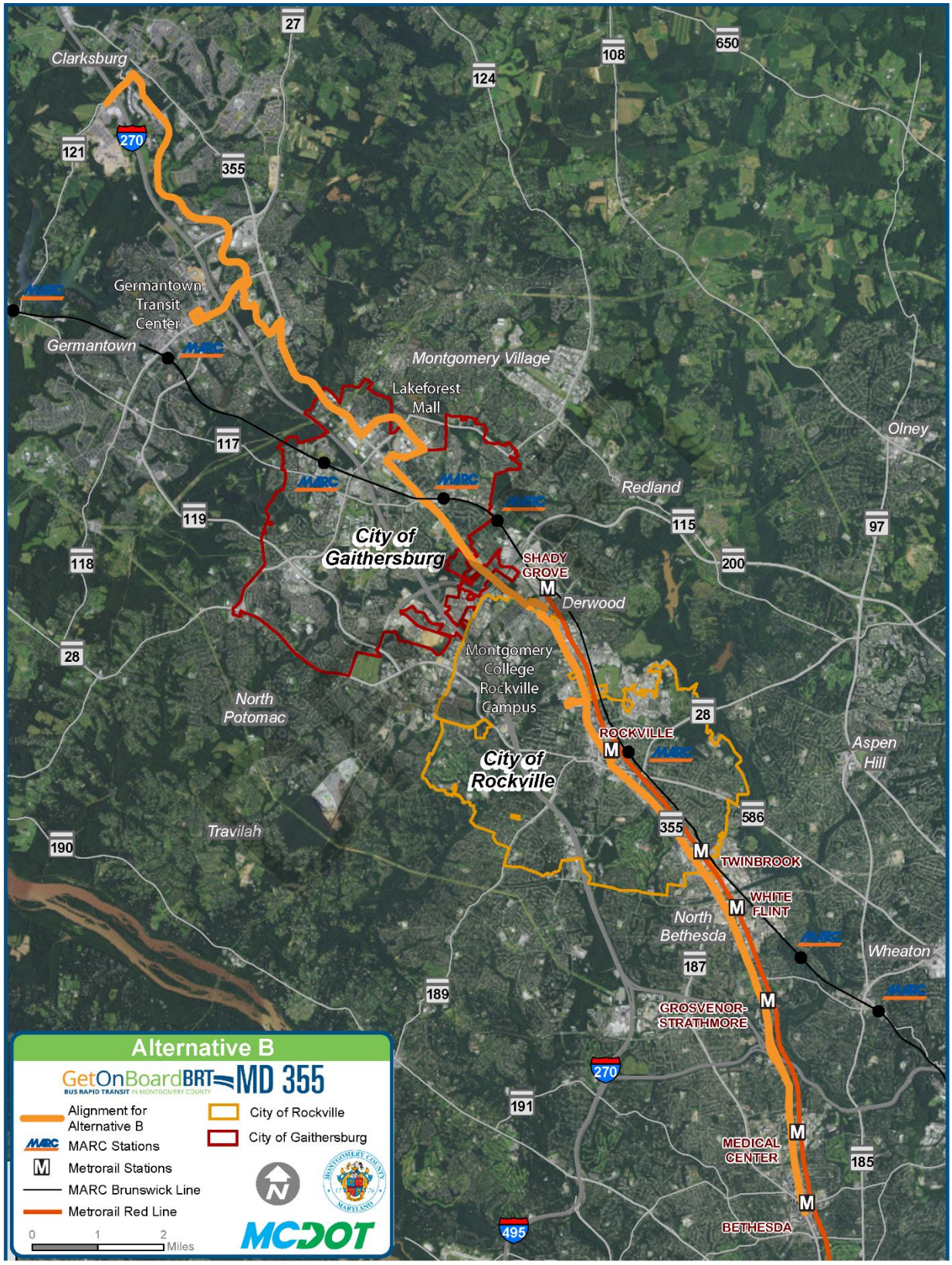
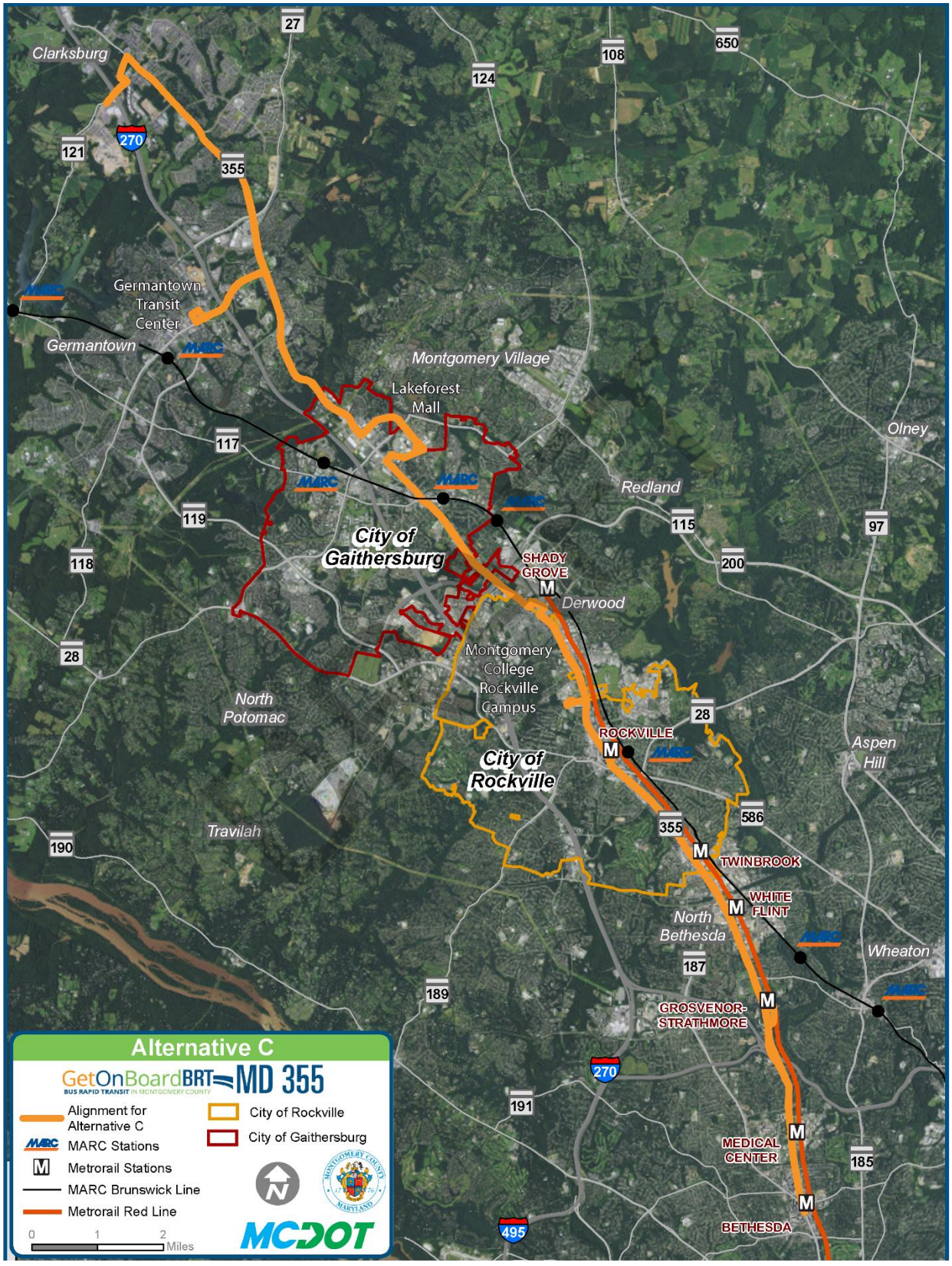


Figure 2-4: Alternative C



1.3 No-Build Alternative

The No-Build Alternative would include no additional infrastructure improvements other than those already planned and programmed, including the Ride on extRa service launched in October 2017 from the Medical Center Metro Station to Lakeforest Transit Center. This service includes Transit Signal Priority (TSP) at key locations along the route.

1.4 Transportation System Management (TSM) Alternative

The TSM Alternative would consist of enhanced bus service operating in mixed traffic using existing lanes from the Bethesda Metrorail Station to Clarksburg along MD 355 and along Clarksburg Road to the Clarksburg BRT terminus.

This Alternative would extend the Ride On extRa service south from the Medical Center Metro Station to Bethesda and north from Lakeforest Transit Center to Clarksburg and would include additional TSP along the route.

1.5 Alternative A

Alternative A would incorporate elements of the TSM Alternative plus additional elements to create a BRT service with limited infrastructure improvements. Alternative A would consist of BRT service, operating in mixed traffic using existing lanes from the Bethesda Metrorail Station to Clarksburg along MD 355. In Segment 7, the BRT would travel along Middlebrook Road to Observation Drive, Goldenrod Lane, Germantown Road, then back to Observation Drive to Ridge Road, and across MD 355 to Snowden Farm Parkway to Stringtown Road to the BRT Terminus at Clarksburg.

Alternative A would include additional TSP along with queue jumps at key locations along the route. It would also include off-board fare collection, level boarding, articulated buses, and Flash branding.

1.6 Alternative B

Alternative B would generally operate in dedicated median lanes where feasible and in mixed traffic in Segments 1 and 7. In Segment 7, the BRT would travel along Middlebrook Road to Observation Drive, including the unbuilt portion, to Stringtown Road to the BRT Terminus at Clarksburg.

Alternative B would include additional TSP at key locations along the route, off-board fare collection, level boarding, articulated buses, and Flash branding.

1.7 Alternative C

Alternative C would generally operate in dedicated curb lanes where feasible. In Segment 7, the BRT would operate in mixed traffic along MD 355 from Middlebrook Road to the BRT Terminus at Clarksburg, via Clarksburg Road and Stringtown Road.

Alternative C would include additional TSP along with queue jumps at key locations along the route. It would also include off-board fare collection, level boarding, articulated buses, and Flash branding.

1.8 Alignment Segments

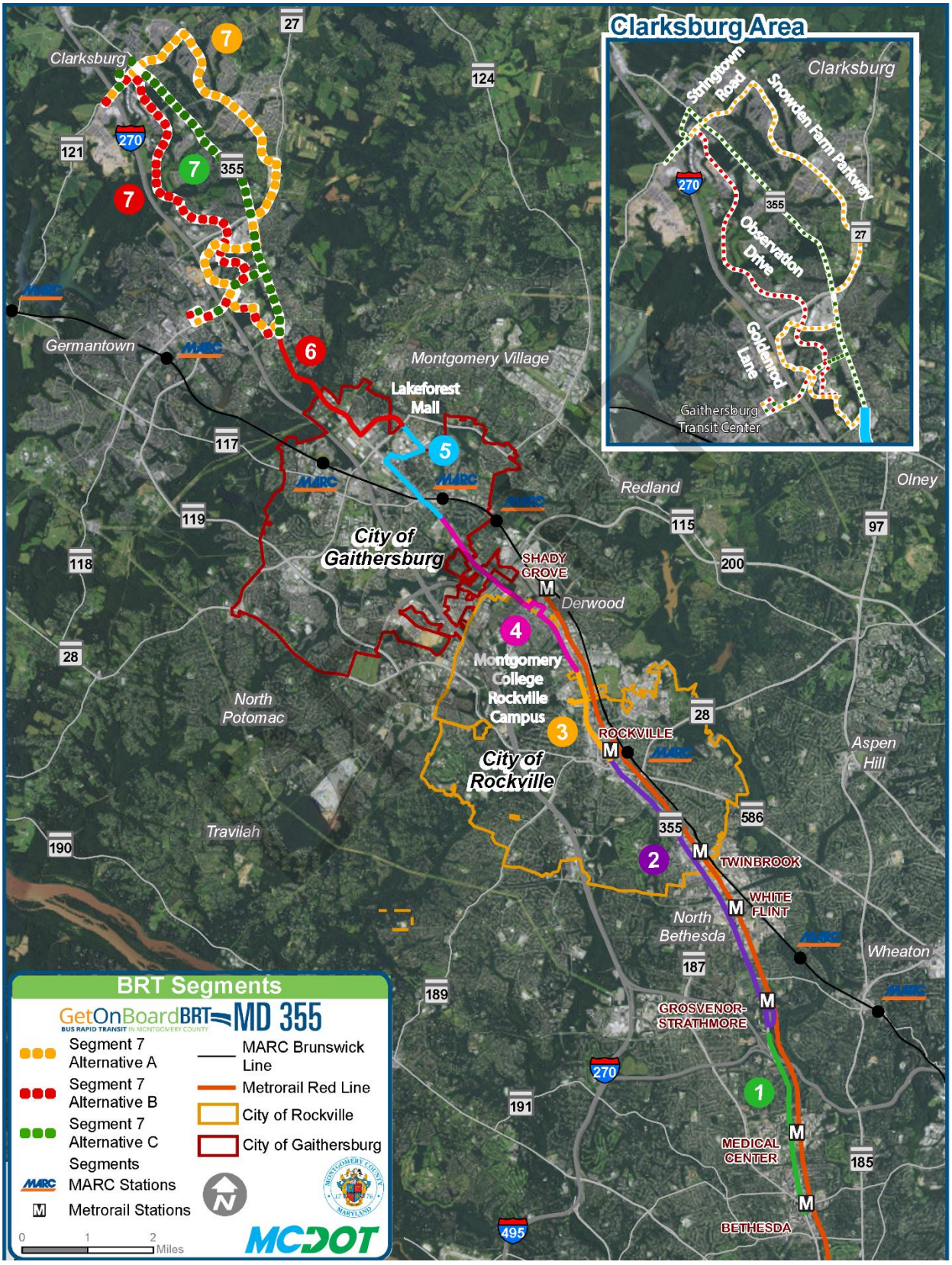
Due to the existing conditions that vary along MD 355 as the roadway transitions from an urban environment in downtown Bethesda to a suburban setting in Clarksburg, the corridor was divided into seven segments during Phase 1 of this study and carried forward into Phase 2. The segments were primarily geographically based with each having its own set of characteristics, opportunities, challenges, and constraints. The seven segments geographic descriptions are listed in **Table 2-1** and shown below in **Figure 2-5**.

Table 2-1: Alternative Alignment Segments

Segment	Geographic Description
1	Bethesda Metrorail Station to Grosvenor Metrorail Station
2	Grosvenor Metrorail Station to Dodge Street
3	Dodge Street to College Parkway
4	College Parkway to Summit Avenue
5	Summit Avenue to MD 124
6	MD 124 to Middlebrook Road
7	Middlebrook Road to Clarksburg

Given the length of the corridor and its varying characteristics and uses, it is expected that a Recommended Alternative would be constructed in stages. In addition, a Recommended Alternative could be pieced together from segments of different alternatives to form a "hybrid" Recommended Alternative. In order to facilitate the identification of a Recommended Alternative, the alternative benefits and impacts have been quantified, as appropriate, based on the seven roadway alignment segments and are presented in **Appendix A.**

Figure 2-5: Alternative Alignment Segments



2 Methodology

For this natural resources analysis, data was primarily compiled from published sources, most significantly Maryland Department of Natural Resources and Maryland Department of Environment data and resource reports. Environmental resource geographic data sets were acquired from the Maryland Open Data portal, Montgomery County GIS Open Data, and other federal and state resource agencies.

The inventory and characteristics of the affected environment were compiled within a composite study area encompassing a one-half mile buffer from the centerline of each proposed alternative **(Figure 3-1)**.

Potential environmental resource impacts have been calculated using the limit of disturbance (LOD) for the proposed alternatives. The LOD was developed using the proposed improvements, including necessary roadway widening for running ways, BRT stations, bicycle and pedestrian facilities, and stormwater management facilities. The LOD accounts for an additional ten-foot offset beyond the improvements in most areas to accommodate drainage, utilities, and construction easements. Additional information on the LOD is included in the *Alternatives Technical Report*.

3 Affected Environment and Environmental Consequences

3.1 Topography and Geology

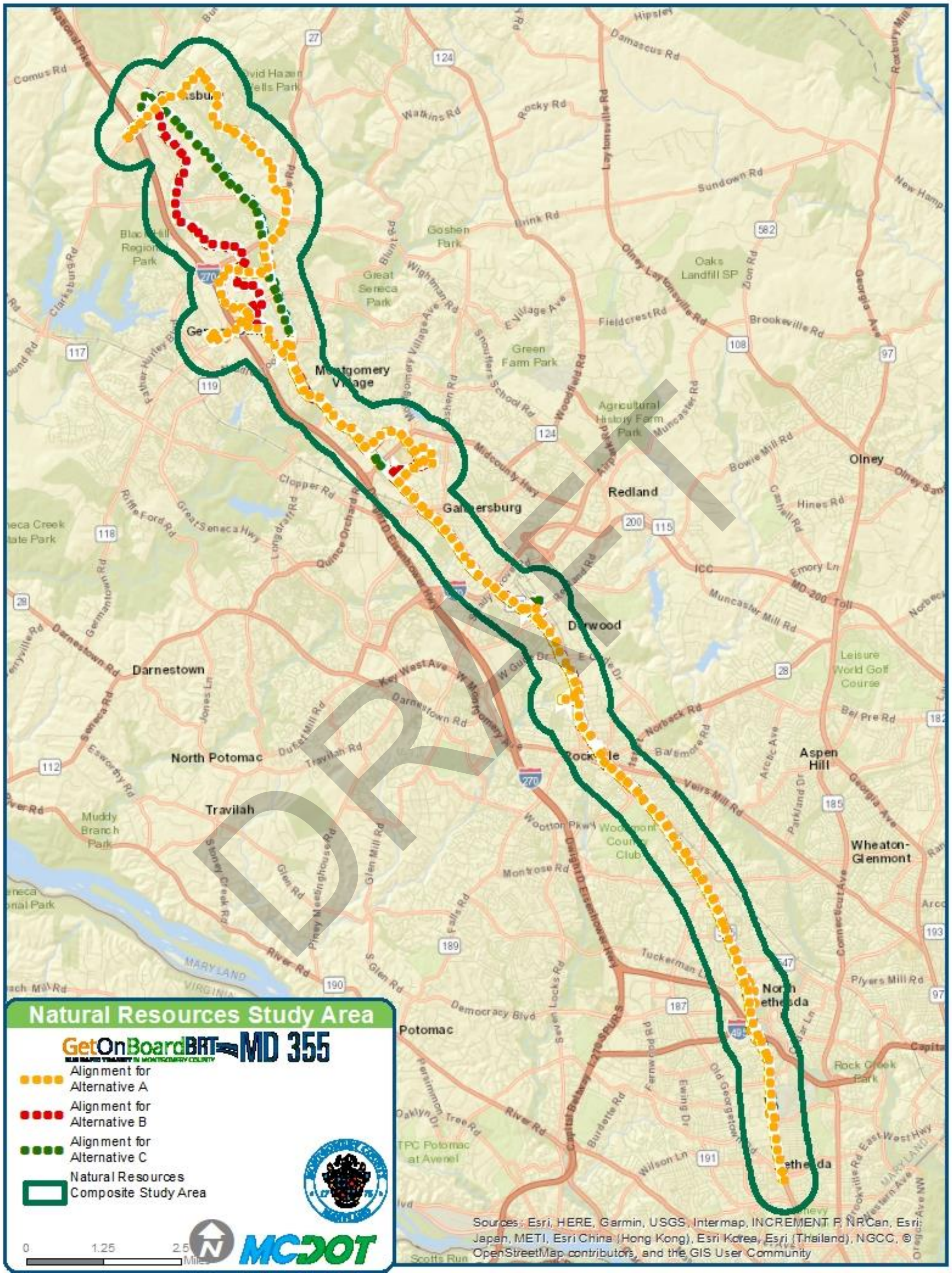
3.1.1 Affected Environment

According to the 2008 Physiographic Map of Maryland, the study area is located within the Piedmont Plateau physiographic region characterized by gently rolling terrain of low relief. Within the study area, elevations generally range from approximately 240 to 640 feet above mean sea level. Topography is generally level to moderately rolling, with lower elevations typically found in the southern extent and surface elevations generally rising to the highest elevations in the study area near Clarksburg. Areas of steep slope are generally limited to stream valley areas.

Geologic formations which underlie the study area (generally south to north) consist of the following:

- Ijamville Formation & Marburg Schist: The Ijamsville Formation is a blue, green, or purple phyllite and phyllitic slate, with interbedded metasiltstone and metagraywacke; flattened pumiceous blebs occur locally. Marburg Schist is a bluish-gray to silvery-green, fine-grained, muscovite-chlorite-albite-quartz schist; intensely cleaved and closely folded; contains interbedded quartzites.

- Wissahickon Formation Upper Pelitic Schist: lbite-chlorite-muscovite-quartz schist with sporadic thin beds of laminated micaceous quartzite; coarsens from west to east; primary sedimentary structures include normal bedding, graded bedding, and soft-sediment deformational structures; apparent thickness 14,000 feet or more.


Natural Resources Study Area
GetOnBoardBRT MD 355
Alignment for Alternative A
Alignment for Alternative B
Alignment for Alternative C
Natural Resources Composite Study Area
0
1.25
2.5
Miles
MCDOT
DRAFT
Clarksburg
Germantown
Montgomery Village
Gaithersburg
Redland
Derwood
Olney
Darnestown
North Potomac
Travilah
Rockville
Aspen Hill
Wheaton-Glenmont
Potomac
North Bethesda
Bethesda
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

- Wissahickon Formation Lower Pelitic Schist: Medium to coarse-grained biotite-oligoclase-muscovite-quartz schist with garnet, staurolite, and kyanite; fine- to medium-grained semipelitic schist; and fine-grained granular to weakly schistose psammitic granulite; psammitic beds increase upward; apparent thickness 5,500 feet or more.

3.1.2 Environmental Consequences

The proposed alternatives would entail only limited excavation in certain segments for roadway widening or conversion of median areas. Therefore, no impacts to geology are projected and the study area would not pose constraints on the proposed construction activities and uses.

3.2 Soils

3.2.1 Affected Environment

Soil types and classifications within the study area were obtained from the USDA, Natural Resources Conservation Service (NCRS) soil survey data for Montgomery County **(Table 3-1)**.

Table 3-1: Soil Types within Study Area

Map Unit Symbol	Map Unit	Prime (P) or Statewide Important (S) farmland soil	Alt A (acres)	Alt B (acres)	Alt C (acres)
1B	Gaila silt loam, 3 to 8 percent slopes	P	1.2	0.0	0.0
1C	Gaila silt loam, 8 to 15 percent slopes	S	7.0	7.0	7.0
2A	Glenelg silt loam, 0 to 3 percent slopes	P	0.2	0.2	0.2
2B	Glenelg silt loam, 3 to 8 percent slopes	P	114.8	114.8	114.8
2C	Glenelg silt loam, 8 to 15 percent slopes	S	30.7	30.7	30.7
2UB	Glenelg-Urban land complex, 0 to 8 percent slopes		0.6	0.6	0.6
2UC	Glenelg-Urban land complex, 8 to 15 percent slopes		1.8	1.8	1.8
4B	Elioak silt loam, 3 to 8 percent slopes	P	6.7	2.7	2.7
4C	Elioak silt loam, 8 to 15 percent slopes	S	0.6	0.0	2.1
5A	Glenville silt loam, 0 to 3 percent slopes		2.2	2.2	2.7
5B	Glenville silt loam, 3 to 8 percent slopes	P	3.7	3.9	8.3
6A	Baile silt loam, 0 to 3 percent slopes		17.5	15.8	14.1
9B	Linganore-Hyattstown channery silt loams, 3 to 8 percent slopes	S	0.0	0.0	4.4
9C	Linganore-Hyattstown channery silt loams, 8 to 15 percent slopes	S	1.4	0.0	7.6
16B	Brinklow-Blocktown channery silt loams, 3 to 8 percent slopes	S	29.2	14.1	14.9
16C	Brinklow-Blocktown channery silt loams, 8 to 15 percent slopes		40.0	22.9	6.7
16D	Brinklow-Blocktown channery silt loams, 15 to 25 percent slopes		10.8	17.8	8.9
17B	Occoquan loam, 3 to 8 percent slopes	P	89.7	74.8	74.1
17C	Occoquan loam, 8 to 15 percent slopes	S	26.6	29.3	14.3
35B	Chrome and Conowingo soils, 3 to 8 percent slopes		1.8	1.7	0.0
41B	Elsinboro silt loam, 3 to 8 percent slopes	P	0.0	0.0	0.0
53A	Codorus silt loam, 0 to 3 percent slopes, occasionally flooded		6.4	6.4	6.4
54A	Hatboro silt loam, 0 to 3 percent slopes, frequently flooded		9.4	7.5	7.5
66UB	Wheaton-Urban land complex, 0 to 8 percent slopes		34.0	34.0	33.9
66UC	Wheaton-Urban land complex, 8 to 15 percent slopes		0.1	0.1	0.1

Map Unit Symbol	Map Unit	Prime (P) or Statewide Important (S) farmland soil	Alt A (acres)	Alt B (acres)	Alt C (acres)
67UB	Urban land-Wheaton complex, 0 to 8 percent slopes		32.9	32.9	32.9
116D	Blocktown channery silt loam, 15 to 25 percent slopes, very rocky		5.6	4.4	4.4
116E	Blocktown channery silt loam, 25 to 45 percent slopes, very rocky		0.3	0.3	0.3
400	Urban land		159.3	159.3	159.3
W	Census water		0.2	0.2	0.2

3.2.2 Environmental Consequences

The No-Build and TSM Alternatives would not involve any construction or changes to the natural environment. As a result, effects to soil resources are not anticipated.

The majority of soil impacts from the Build Alternatives (widening and station development) would occur in soils classified as "Urban" (e.g. already committed and impacted by community development) and not affect soils classified as prime farmland soils or soils of statewide importance.

Prime farmland and soils of statewide importance support the production of food and similar crops in Maryland. Conversion of these soils to non-agricultural use as part of a major federal action must consider compliance with the federal Farmland Protection Policy Act (7 U.S.C. 4201 et seq). Impacts of the Build Alternatives would need to consider compliance with the federal Farmland Protection Policy Act and coordination with the NRCS if farmland soils are proposed to be converted to non-agricultural use in areas where those soils are not already committed to urban use.

Construction activities proposed would require consideration of unstable or erodible soils as part of the erosion and sedimentation control plan (ESCP) to comply with Maryland Erosion and Sediment Control Regulations (COMAR 26.17.01). Best management practices (BMPs) would be required to be implemented to minimize soil erosion during construction activities.

3.3 Surface Water Resources and Water Quality

3.3.1 Affected Environment

The study area falls within four Maryland 8-digit watersheds:

- Cabin John Creek (02140207)
- Potomac River (02140202)
- Rock Creek (02140206)
- Seneca Creek (02140208)

In compliance with Clean Water Act (CWA) Sections 303(d), 305(b), and 314 and the Safe Drinking Water Act, states develop a prioritized list of waterbodies that currently do not meet water quality standards. The 303(d) prioritized list includes those waterbodies and watersheds that exhibit levels of impairment requiring further investigation or restoration. Waterbodies on this list require the development of a Total Maximum Daily Load (TMDL) calculation, which is the maximum amount of a pollutant that a waterbody can receive while still meeting water quality standards **(Table 3-2)**.

Table 3-2: TMDLs for Study Area Watersheds

Watershed	TMDL Category	Approval Year
Potomac River	Total Suspended Solids – Sediment	2012
Rock Creek	Phosphorus	2014
	Total Suspended Solids - Sediment	2011
	Bacteria - Enterococcus	2007
Cabin John Creek	Bacteria – Escherichia coli	2007
	Total Suspended Solids - Sediment	2011
Seneca Creek	Total Suspended Solids - Sediment	2011

Source: http://mde.maryland.gov/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/index.aspx

MDE has assigned designated use codes to each waterbody in the Code of Maryland Regulations (COMAR 26.08.08.08). This list was most recently updated in July of 2014 and waters crossed by the study area are reflected in the categories below. The use class is a set of designated water uses that apply to a waterbody which individually, may or may not be supported now, but should be attainable. Many are protected for recreational use, public water supply, or aquatic life and will require close coordination with regulating agencies throughout further planning and design efforts associated with this project. The following information in **Table 3-3** was gathered from the MDE designated use website and the "Maryland's Designated Uses/Use Class Map", interactive online map (MDE, 2014) for watersheds crossed by the study area.

Table 3-3: Streams and Designated Water Quality Uses

12 digit HUC	Watershed	MDE Use Class	Protection Use
020700100202	Coquelin Run/Rock Creek/Rock Creek	I	Water Contact Recreation and Protection of Nontidal Warmwater Aquatic Life
020800100201	Rock Creek		
020700080605	Willett Branch/Little Falls	I-P	Water Contact Recreation, Protection of Aquatic Life, and Public Water Supply
020700080603	Cabin John Creek/Old Farm Creek		
020700080401	Great Seneca Creek/Gunners Branch/Whetstone Run		
020700080403	Long Drought Branch		
020700080402	Tenmile Creek		
020700080601	Muddy Branch		

12 digit HUC	Watershed	MDE Use Class	Protection Use
020700080401	Wildcat Branch	III-P	Non-tidal Cold Water and Public Water Supply
020700090805	Little Bennett Creek		
020700100201	Crabbs Creek	IV	Recreational Trout Waters
020700080402	Little Seneca Creek/Cabin Branch	IV-P	Recreational Trout Waters and Public Water Supply

3.3.2 Environmental Consequences

The No-Build and TSM Alternatives would not involve any construction or changes to the natural environment. As a result, environmental effects to surface water resources are not anticipated.

Implementation of Alternatives A, B, or C may involve permanent or temporary impacts to surface water resources. **Table 3-4** provides all the watersheds that could be potentially impacted by the Build Alternatives. The estimated area of impact is the total watershed area within the LOD that would be converted to transit use.

Table 3-4: Potential Impacts to Watersheds (acres)

12 digit HUC	Watershed	TSM Alternative	Alternative A	Alternative B	Alternative C
020700100202	Coquelin Run/Rock Creek/Rock Creek	0	0	0	0
020800100201	Rock Creek	0	0	0	0
020700080605	Willett Branch/Little Falls	0	0	0	0
020700080603	Cabin John Creek/Old Farm Creek	0	0	0	0
020700080401	Great Seneca Creek/Gunners Branch/Whetstone Run	0	0	0	0
020700080403	Long Drought Branch	0	0	0	0
020700080402	Tenmile Creek	0	0	0	0
020700080601	Muddy Branch	0	0	0	0
020700080401	Wildcat Branch	0	0	0	0
020700090805	Little Bennett Creek	0	0	0	0
020700100201	Crabbs Creek	0	0	0	0
020700080402	Little Seneca Creek/Cabin Branch	0	0	0	0

Construction stage impacts to watersheds would be primarily related to protection of water quality through implementation of erosion and sediment controls and construction vehicle and fuels management.

3.4 Hydrogeology and Groundwater

3.4.1 Affected Environment

According to the Maryland Geological Survey (MGS), Montgomery County is located within the Piedmont Plateau Physiographic Province. The rocks of the western part of the Piedmont are diverse and include phyllite, slate, marble, and moderately to slightly metamorphosed volcanic rocks (MGSb, 2018).

The "Aquifers of Maryland" section of the MGS website shows the southeastern border of Montgomery County lays on the Fall Line between the Piedmont Plateau Province and the Atlantic Gulf Coastal Plain Province. West of the Fall Line, groundwater is found in fractures in consolidated rock (igneous, metamorphic, or consolidated sedimentary rock). The water table may occur above or below the Unconsolidated and Consolidated rock interface. Most aquifers in the Piedmont Province are unconfined/water-table aquifers and limestone aquifers occur locally in the Piedmont. In the Maryland Piedmont Plateau Province, groundwater comes from rain/snowfall. Wells drilled in valleys generally have greater well yields than those drilled in uplands or slopes. Wells in this region are drilled to a few hundred feet deep. However, unconfined aquifers in the piedmont region are more susceptible to drought. Well yields are low and can flow typically only a few gpm (gallons per minute) (MGS, 2018a).

According to the Environmental Protection Agency's (EPA) sole source aquifers (SSA) interactive online map, the study area is underlain by the, "Piedmont (Maryland Piedmont) Aquifer Montgomery, Howard, Carroll Counties", sole source aquifer-30. A SSA as defined by EPA as an aquifer that supplies at least 50 percent of the drinking water for its service area and there are no reasonably available alternative drinking water sources should the aquifer become contaminated. The SSA-30 aquifer is located north of the MD 355 intersection with MD-118/Germantown Road in the northern extent of the study area (EPA, 2018).

3.4.2 Environmental Consequences

The No-Build and TSM Alternatives would not involve any construction or changes to the natural environment. As a result, environmental effects to hydrogeology or groundwater resources are not anticipated.

Under the Build Alternatives, there would be no permanent effects on hydrogeology and geology. Potential temporary effects from construction activities, including excavation grading, would be addressed through erosion and sediment controls to protect groundwater aquifers. Compliance with the requirements of the federal Safe Water Drinking Act through Sole Source Aquifer review would need to be completed with EPA Region 3 during future project development phases.

3.5 Wetlands

3.5.1 Affected Environment

Review of the Maryland Department of Natural Resources (DNR) wetlands shapefile, shows that several DNR wetlands **(Table 3-5)** are located within the 200-foot buffer around each Build Alternative (MD iMAP, 1995).

Table 3-5: Study Area Wetlands

Wetland Type	Alt A (acres)	Alt B (acres)	Alt C (acres)
Palustrine (PEM1C)	0.40	0.40	0.15
Palustrine (PFO1/EM1A)	0.00	0.00	0.06
Palustrine (PFO1A)	0.51	0.51	0.57
Palustrine (PFO1Fh)	0.00	0.00	0.20
Palustrine (PUBHx)	0.30	0.30	0.30
Riverine (R2UBH)	0.35	0.35	0.35

The MDE identifies and regulates Wetlands of Special State Concern (WSSC) which provide habitat for rare, threatened and endangered species. WSSC wetlands are regulated under the Code of Maryland Regulations (COMAR) Title 26 - Subtitle 23 - Chapter 06 - Sections 01 & 02 and affords them certain protections including a 100-foot buffer from development.

A WSSC, known locally as the Germantown Bog, is located west of MD 355 and north of Germantown Road, just north of the Meadowbrook Estates community. The wetland complex is bisected by Observation Drive and is considered a Nontidal WSSC. The wetland may contain threatened plant species such as the Buxbaum's Sedge, Canada Burnet, and Swamp Oats.

3.5.2 Environmental Consequences

No impacts to wetland resources are anticipated with implementation of the No-Build and TSM Alternatives as no physical changes or improvements would be constructed.

Under the Build Alternatives, wetlands may be permanently impacted through encroachment of construction and temporarily from construction activities in the vicinity of wetland resources (Table 3-6). Based on DNR mapping, the wetland potentially impacted in Segment 4 is a palustrine wetland near Bohrer Park in Gaithersburg; however, based on aerial photography it appears there is adequate space to avoid impact to this resource through design shifts or treatments such as retaining walls.

Table 3-6: Potential Impacts to Wetlands

Wetlands (Acres)	No-Build Alternative	TSM Alternative	Alternative A: Mixed Traffic	Alternative B: Median	Alternative C: Curb
Segment 1	N/A	0	0	0	0
Segment 2	N/A	0	0	0	0
Segment 3	N/A	0	0	0	0
Segment 4	N/A	0	0	0.15	0.08
Segment 5	N/A	0	0	0	0
Segment 6	N/A	0	0	0	0
Segment 7	N/A	0	0	0	0
Total	**N/A**	**0**	**0**	**0.15**	**0.08**

During future project development, wetland resources would be required to be field delineated in accordance with applicable USACE delineation guidance. Detailed impact assessment using refined design would then be used to avoid and minimize impacts to wetland resources.

If impacts to wetlands are unavoidable, applicable state and federal permits will be required. A federal Clean Water Act, Section 404 permit from the USACE would be required for the discharge of dredged or fill material into wetlands. State permits likely required would include a Nontidal Wetlands Permit, a Section 401 Water Quality Certificate, a Waterway Construction Permit. No impacts to the Germantown Bog are anticipated from the Build Alternatives, including Alternative B which would use Observation Drive.

3.6 Floodplains

3.6.1 Affected Environment

100-year floodplains were identified using Flood Insurance Rate Maps (FIRM) produced by the Federal Emergency Management Agency (FEMA). Nontidal floodplains are regulated at the state level by MDE.

Executive Order 11988, Floodplain Management, requires avoidance of effects from federal actions associated with the modification of and development in floodplains when practicable alternatives exists. Floodplains are regulated at the state and local levels and any construction in the floodplain would require a Waterway Construction Permit from MDE. Development in floodplains may reduce flood storage capacity and places development in the floodplain and downstream properties at risk.

Portions of the environmental study area either cross or border several floodplain areas, including Great Seneca Creek, Muddy Branch, and Rock Creek. These stream areas fall within the 100-year floodplain.

The study alternatives are configured in such a manner that major longitudinal (parallel) floodplain encroachments would be avoided. The majority of floodplain encroachments would be from transverse

(perpendicular) crossings where the BRT would cross the valley widths of floodplains at existing roadway crossings.

3.6.2 Environmental Consequences

As no physical changes are proposed, the No-Build Alternative would not affect floodplain resources.

In compliance with Executive Order 11998, Floodplain Management, mitigation would be required if the Build Alternatives encroach on existing 100-year floodplains through fill activities (Table 3-7). To comply with EO 11998, future design phases would need to consider methods to avoid and minimize floodplain impacts. Coordination with MDE would be necessary and an MDE Waterways Construction Permit would be required if physical impacts to floodplains are proposed. Impacts to the existing floodplains may be minimized by modifying the project design such as minimizing slope impacts, bridge, culvert, and crossing structures to maintain the current flow regime.

Table 3-7: Potential Impacts to Floodplains

100-year Floodplain (Acres)	No-Build Alternative	TSM Alternative	Alternative A: Mixed Traffic	Alternative B: Median	Alternative C: Curb
Segment 1	N/A	0	0	0	0
Segment 2	N/A	0	0	0	0
Segment 3	N/A	0	0	0	0
Segment 4	N/A	0	0	0.28	0.25
Segment 5	N/A	0	0	0	0
Segment 6	N/A	0	0	0.45	0.32
Segment 7	N/A	0	0	0	0
Total	**N/A**	**0**	**0**	**0.73**	**0.57**

Temporary impacts on floodplains would be managed through compliance with erosion and sediment control plans and construction-stage storm water management requirements.

3.7 Special Protection Areas

3.7.1 Affected Environment

According to the countywide Special Protection Areas (SPA) map for Montgomery County, MD, there are four SPAs in Montgomery County (County, 2012). Two SPAs, the Ten Mile Creek SPA and the Clarksburg SPA, abut each other to form one large complex. The complex is located north of the MD 355 intersection with MD 27 at the northern extent of the study area. The county's SPAs require protections beyond standard environmental laws, regulations, and guidelines for land development and certain uses. A special protection area overlays the northern extent of the study area north of the intersection with MD-27/Ridge Road.

Maryland Biodiversity Conservation Network (BIONET) areas identify and prioritize ecologically important lands to conserve Maryland's biodiversity (plants, animals, habitats, and landscapes). The Biodiversity Conservation areas were created to prioritize areas that are targeted for conservation efforts and were placed in a Five Tier system for Biodiversity Conservation:

- Tier 1 – Critically Significant
- Tier 2 – Extremely Significant
- Tier 3 – Highly Significant
- Tier 4 – Moderately Significant
- Tier 5 – Significant

A review of the BIONET data shows that the MD 355 study area abuts or lays adjacent to mainly Tier 5 Biodiversity Conservation areas **(Table 3-8)** (MDiMAP, 2018). A Tier 3 area lies within the northern extent of the study area, however none of the proposed BRT alternatives would extend north of the intersection of MD 355 and Clarksburg Road and would therefore have no direct or indirect effects on this resource.

Table 3-8: MD BioNet Areas within Study Area

BioNet Tier	Alt A (acres)	Alt B (acres)	Alt C (acres)
Tier 3 (Highly Significant)	16.7	16.7	0.0
Tier 4 (Moderately Significant)	0.0	0.0	15.95
Tier 5 (Significant)	50.1	70.7	9.22

3.7.2 Environmental Consequences

No impacts to Special Protection Areas would be associated with the No-Build and TSM Alternatives

Activities and construction within Montgomery County Special Protection Areas are subject to stringent water resource protection measures, potentially including pre and post construction monitoring. Avoidance of Special Protection Areas, including any regulatory buffers, must be considered in the design of the Build Alternatives. Where avoidance would not be possible, coordination with MDNR and Montgomery County Department of Environmental Protection would be required to evaluate minimization, and potentially, mitigation options. Impact consideration in these areas must also carefully consider temporary, construction-stage effects to protect sensitive habitats and natural conditions.

3.8 Vegetation and Wildlife

3.8.1 Affected Environment

The study area is located within the USDA Land Resource Region (LRR) Eastern Mountains and Piedmont. Within the LRR, the study area lays within the sub-region, the Major Land Resource Region (MLRA)

Northern Mountains and Piedmont. Approximately 25 percent of the Piedmont region is forested, while the remainder is agricultural and urban development. Common tree species in this region include white oak, black oak, northern red oak, bear oak, chestnut oak, American elm, hickories, tulip tree, Virginia pine, pitch pine and eastern red cedar (USACE, 2012). This forest community is also called the Chestnut Oak-Bear Oak Association and Tulip Tree Association (Brush et al. 1980).

The Maryland GIS data catalog has a layer called, Maryland Living Resources – Forest Interior Dwelling Species (FIDS). This is only a potential habitat layer for FIDS, and the data is only the result of a model depicting where FIDS habitat might occur based on certain criteria. These polygons have not been field tested or field verified for actual FIDS presence. Review of the FIDS shapefile shows that several potential FIDS habitat areas are within the study area **(Table 3-9)**. The FIDS habitat coincides with the forest land cover and the Maryland Biodiversity Conservation Network areas. The majority of FIDS areas within the study area correlate with the Little Seneca and Great Seneca stream valleys.

Table 3-9: MD FIDS Habitat Areas within Study Area

	Alt A (acres)	Alt B (acres)	Alt C (acres)
FIDS Habitat	50.03	70.72	11.24

Throughout the MD 355 corridor study area, developed areas contain small clusters of trees. A review of the "Montgomery County Forest Area" mapping shows the majority of the forested stands bordering MD 355 are located around stream valleys, especially north of Gaithersburg (Montgomery, 2014). The largest forest stands are also located north of the intersection of MD-124/Quince Orchard Road. Additionally, a large forest stand surrounds the intersection with I-495 at the southern extent of the study area.

According to the MD DNR – Wildlife and Heritage Service website, "Maryland's Wildlife Species", typical wildlife found within the habitats of the study area would include gray squirrel, chipmunk, raccoon, opossums, various songbirds, crows, raptors, white tail deer, beaver, turtles, snakes, salamanders, and frogs (DNR, 2018b).

3.8.2 Environmental Consequences

The No Build and TSM Alternatives would have no impact on vegetation or terrestrial habitat within the study area.

No impacts to forest lands are anticipated from construction of the Build Alternatives, although individual trees may be impacted along existing roadways to accommodate widening or station placement.

Future design phases will require forest stand delineations to provide detailed consideration of impacts in accordance with the Maryland Forest Conservation Act, the Montgomery County Forest Conservation Law, and the Maryland Roadside Tree Law. Coordination with MDNR would also be necessary to consider effects of the project on FIDS habitat and mitigation approaches.

3.9 Rare, Threatened and Endangered Species

3.9.1 Affected Environment

Species of concern noted by the U.S. Fish and Wildlife Service for Montgomery County, MD include: Hay's Spring amphipod *(Stygobromus hayi),* Indiana bat *(Myotis sodalist)*, and Northern Long-Eared bat *(Myotis septentrionalis)*.

The Maryland DNR – Wildlife and Heritage Service, Natural Heritage Program created a "List of Rare, Threatened, and Endangered Plant Species of Montgomery County" in January of 2018. There are 742 native plants that are listed as Rare, Threatened and Endangered (RTE) species. Concurrently the "List of Rare, Threatened, and Endangered Animals of Maryland", created in December 2016, lists 514 native RTE animals. Both lists can be found on the DNR RTE website (DNR, 2018c and DNR, 2016).

Maryland DNR – Wildlife and Heritage Service has defines Maryland Living Resources - Sensitive Species Project Review Areas (SSPRA), which represent the general location of documented rare, threatened and endangered species. These areas incorporate various types of regulated areas under the Critical Area Criteria and other areas of concern statewide, including: Natural Heritage Areas, Listed Species Sites, Other or Locally Significant Habitat Areas, Colonial Waterbird Sites, Nontidal Wetlands of Special State Concern, and Geographic Areas of Particular Concern. The SSPRAs are designed specifically for reviewing proposed development projects. There are only two SSPRAs within or near study area (MDiMAP, 2010). One area is located between MD 355 and I-270, and their intersections of Ridge Road and Germantown Road/MD-118. It surrounds the Germantown Bog, a wetland of special state concern. The edge of a large SSPRA is located at the northern boundary study area and north of the intersection with MD-121. This SSPRA overlaps with SPAs, TEAs (described below), and Biodiversity Conservation areas.

The Germantown Bog, located within the study area and west of MD 355 in the northern portion of the study area, is considered a Nontidal Wetland of Special State Concern. The wetland may contain threatened plant species such as the Buxbaum's Sedge, Canada Burnet, and Swamp Oats.

3.9.2 Environmental Consequences

No effects on rare, threatened or endangered species would be generated by implementation of the No-Build and TSM Alternative.

No impacts to rare, threatened and endangered species are anticipated from construction and operation of the Build Alternatives. While the proposed BRT system would use Observation Drive adjacent ot the Germantown Bog, no physical improvements are proposed in the area associated with the MD 355 BRT project. Potential effects on rare, threatened, and endangered species would need to be evaluated through coordination with the U.S. Fish and Wildlife Service and the MDNR. Effects on these species of concern would be closely tied to identified impacts on surface waters, wetlands, terrestrial vegetation, forests, or other special resource lands which may provide suitable habitat. Potential permanent impacts to species or habitats would require additional survey and study to fully characterize impacts and potential mitigation measures. Temporary impacts related to construction activities can typically be managed

through use of BMPs, proper erosion and sediment controls, and time-of-year or other activity restrictions.

3.10 Land and Forest Conservation and Green Infrastructure

3.10.1 Affected Environment

There are existing Maryland forest conservation easements located within the study area and adjacent to or abutting the MD 355 corridor. Most of the conservation easements are located north of the intersection with MD-118/Germantown Road (MDimap, 2018b). The conservation easements are generally co-located with residential and commercial development areas and lay along existing riparian corridors.

Green Infrastructure includes hubs (large, unfragmented habitat areas), corridors (linear remnants of natural land that connect hubs), and gaps (developed areas) **(Table 3-10)**. While hubs provide important habitat to native plants and animals, corridors allow movement of animals, seeds, and pollen to support long-term survival and diversity. Many of these hubs, and especially corridors, follow stream valleys. Within the study area, both hub and corridor areas are found near Little Seneca Creek, Great Seneca Creek, Muddy Branch, and Rock Creek. The major gap location is identified in the northern part of the study area involving the North Germantown Greenway Stream Valley Park and Little Seneca Creek.

Table 3-10: MDNR Green Infrastructure within Study Area

Component	Alt A (acres)	Alt B (acres)	Alt C (acres)
Corridor	59	47	72
Hub	7	5	5
Gap	56	58	65

3.10.2 Environmental Consequences

The No-Build and TSM Alternatives would have no impact on Maryland Green Infrastructure resources or conservation easements.

Each of the Build Alternatives may have an impact on identified Maryland Green Infrastructure components but are not anticipated to have a substantial adverse effect. Green infrastructure components highly correspond with natural resource areas of concern which typically have a regulatory or other specific legal consideration. Consideration of Green Infrastructure is non-regulatory but provides an additional basis for developing potentially multi-value mitigation strategies.

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